

A Using Data Workshop participant posts charts on the "data wall."



feature

Bringing Data Literacy to Districts

By Nancy Love

There's a ton of data being collected. The trick is to know how to use it effectively.

When educators in one Texas high school saw African-American students' performance drop slightly below 50% on their state mathematics test, putting the school on the state's list of low-performing schools, they reacted quickly. Decision makers immediately suggested that all African-American students, whether or not they failed the test, be assigned peer tutors (Olsen, 2003).

Based on one piece of data and one way of looking at that data, these decision makers made assumptions and leapt to action before fully understanding the issue or verifying their assumptions with other data sources.

They ignored past trends, which indicated that African-American students' scores were on an upward trajectory. They failed to consider that the decline was so small that it could better be explained by chance or measuring error than by their instructional program. They considered only the percent failing without digging deeper into the data to consider what students needed. Finally, their proposed intervention targeted only African-American students, while overlooking Hispanic and white students who also failed the test.

The Using Data Project, a collaboration between TERC and WestEd, helps mathematics and science educators develop data literacy—the ability to examine multiple measures and multiple levels of data, to consider the research, and to draw sound inferences. Funded by the National Science Foundation, the Using Data Project gets teachers involved in rigorous data analysis and reflective dialogue to improve how math and science are taught and learned and to close achievement gaps. Through the project, teachers and administrators become data facilitators, leading school data teams to dig deeply into several data sources. And they learn, as the Texas example illustrates, that superficial data analysis can be worse than none.

The project partners with several mathematics and science education improvement projects nationally that reflect a mix of urban and rural schools, most of which are high-poverty. After just two years, schools participating in the project are starting to see significant gains in student achievement. For example, all four participating middle schools in Canton City, Ohio, part of the Stark County Mathematics and Science Partnership, increased the percentage of students who scored proficient or above in mathematics on the Ohio Proficiency Test from 2002-2003 to 2003-2004. Two of these schools doubled that

percentage. These and other Using Data sites are showing steady improvement on state assessments as well as other measures such as local and common grade-level and course assessments in both mathematics and science.

Using data differently

Having data available does not mean the data are used to guide instructional improvement. Many schools lack the process to connect the data they have with the results they must produce. The Using Data Project focuses on developing professional developers, administrators, and teachers who can lead a collaborative inquiry process. The aim is to influence school culture to be one in which educators work together to use data continuously and effectively to improve teaching and learning mathematics and science.

In the Using Data approach, data teams investigate not scientific phenomena or mathematics problems, but how to improve teaching and learning. They raise questions, examine student learning and other data, test their hypotheses, and share findings with their colleagues.

Typically, one or two teachers, one administrator, and one National Science Foundation (NSF) project staff member become data facilitators for a school. They then convene school-based data teams to focus on improving mathematics and science. Sometimes team members are from the mathematics or science department or are existing grade-level teams. Other times, the team is school-wide.

Creating Data Facilitators

Data facilitators learn to facilitate teams and to use data in a 12-day workshop series over 1½ to two years, with on-site follow-up and coaching several times a year for three years.

The professional learning program includes five segments: laying the foundation (committing to core values, establishing data teams, and working effectively in the school's context); identifying the student learning problem; verifying causes; generating and monitoring solutions; and achieving student learning goals. In each segment, data facilitators conduct a sequence of activities and data experiences with their data teams, master relevant data concepts and tools, practice facilitation, and plan for implementation.

They then carry out those activities with their data teams with support from NSF project staff at the site and coaching from Using Data Project staff. They reconvene for the next segment of the workshop, reflect on their experiences, and learn how to implement the next segment of the program.

For example, in the segment on identifying a student learning problem, data facilitators practice analyzing multiple levels of student learning data. They start with aggregate data trends, such as the percent of students proficient in state assessments in mathematics or science, then examine disaggregated data to understand how subgroups, such as African-American or Hispanic students, are performing relative to white students. They dig into the content strands, such as geometry, measurement, number sense, and problem solving, and analyze how students performed on individual test items. Finally, they collect and examine student work on items and strands of greatest concern to understand student thinking.

If data facilitators have only one source of data on student learning, they collect additional data such as local assessments or common grade-level and course assessments for the next data facilitator session. The process emphasizes triangulating data, using three different sources of student learning data before identifying the student learning problem. By triangulating, data facilitators guide data teams to test hunches with other data instead of drawing conclusions from a single measure.

As they implement the Using Data approach and collect data, facilitators also learn to interpret data—how to determine what differences in year-to-year or group-to-group test scores are meaningful statistically and educationally (Carr & Altman, 2002).

Data Shifts

LESS EMPHASIS

External accountability

Premature data-driven decision making

Data use as specialty of a few

Data as carrot and stick improvement

Data in isolation

Data to sort

MORE EMPHASIS

Internal and collective responsibility

Ongoing data-driven dialogue

Widespread data use and literacy

Data as feedback for continuous improvement

Data through collaborative inquiry

Data to serve

Data Shifts

After analyzing data in their workshop sessions, the facilitators return to their schools and lead their data teams through the same kind of data analysis experiences they have had. Their job is not to analyze the data for everyone else, but to foster collaboration, build data teams, and facilitate powerful conversations about data—conversations that lead to improved teaching and learning.

To help bring about these cultural shifts, data facilitators learn a variety of tools and processes to make working with data a positive and collaborative learning experience for the data team. One tool is data-driven dialogue, a structured process for making sense of data (Wellman & Lipton, 2004). First, team members predict what they think they will see in the data. Predicting activates prior knowledge, surfaces assumptions and questions, and prepares and motivates the data team to learn from the data. For example, a team member might say, “I predict that physical science will be our weakest content strand on our 4th-grade state test results.” Next, data team members make factual observations only, such as, “25% of our 4th-grade students were proficient in physical science in the state test in 2003.” This phase extends the opportunity to explore and discover the data before jumping to explanations or conclusions. Finally, data team members interpret the data. For instance, a team member might say, “I think our results in physical science are because our teachers do not feel comfortable with the physical science content they are supposed to teach.” Participants test their interpretations by collecting additional evidence to support them.

In their data facilitator workshops, data facilitators use the “go visual” principle, first developed by nonverbal communications expert Michael Grinder (1997). Grinder revealed the power of large, visually vibrant and color-coded displays of data in fostering group ownership and engagement. Data facilitators work with the team on one data report at a time to avoid overload and confusion. For each report, they create a colorful newsprint-sized graph displaying the results and post it on their “data wall.” Then they record their observations and inferences on additional pieces of newsprint that they post under their chart. As they work with additional data, they add more graphs and more observations and inferences to their data wall.

Stoplight highlighting is another “go visual” tool for color-coding that data facilitators learn to use with their teams (Sargeant, 2004). Based on No Child Left Behind Act



Nancy Love (standing) helps Using Data workshop participants “dig into” the data.

requirements and/or state and district goals, data teams set criteria for high performance, performance below expectations, and performance that is urgent and in need of immediate improvement. They then color code each graph using green (high performance), yellow (below expectations), and red (urgent) markers. With stoplight highlighting, urgent areas pop out across the multiple data sources on the data wall.

All this takes place before the team makes any decisions. Data-driven dialogue creates a more thoughtful decision-making process by bringing out multiple perspectives. Teachers embrace solutions because they own the student learning problems that emerge from their own data analysis.

Data facilitators learn how to facilitate data-driven dialogue through repeated practice, feedback from Using Data Project staff, and self-reflection both in workshop sessions and on site with their data teams.

Root Cause Analysis

“Once you find out what your weak points are, you can begin to decide what is causing them and intervene in those areas,” explained Stark County Data Facilitator JoMarie Kutscher. Data facilitators learn that to uncover root causes of students’ poor performance, they collect and analyze other kinds of data, such as disaggregated course enrollment data, interviews with students, classroom observations, and survey data.

In the TASEL-M Project, for example, mathematics teachers from four Orange County, California, high schools and their feeder middle schools cross-tabulated disaggregated student achievement data with disaggregated course enrollments. They discovered that subgroups performing poorly in mathematics often were those trapped in low-level mathematics courses. The data teams used the information as a catalyst and guide to expand opportunities to offer rigorous mathematics instruction to more students.

While local data can uncover achievement gaps and specific student learning problems, those data are not sufficient. To understand possible causes and solutions, teams consider relevant research on mathematics and science achievement. The message in the research is that quick fixes like teaching to the test or tutoring a few students are unlikely to produce sustained improvement in student learning.

Unlike action plans generated from the top down, teachers are invested in the solutions they generate from their own collaborative inquiry. As Richard Dinko, former co-principal investigator of Stark County (Ohio) Mathematics and Science Partnership, said, “Until teachers started talking deeply about the data, they would create plans that never got implemented. The best thing about the Using Data Project is that it engages teachers in deep discussion of data.

“Using data used to mean rubbing teachers’ noses in poor performance,” he said. “But that didn’t get us anywhere. Now we have a process that gives teachers a voice and a lens for looking at data. With teachers as the change agents, we are starting to see real movement.”

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PROJECT PARTNERS

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